

## Claims

- [c1] 1. An alkylation catalyst comprising a metal oxide wherein the catalyst has a surface area to volume ratio of about  $950 \text{ m}^2/\text{m}^3$  to about  $4,000 \text{ m}^2/\text{m}^3$ .
2. The catalyst of claim 1, wherein the metal oxide comprises magnesium oxide, iron oxide or a combination of the foregoing.
- [c2] 3. The catalyst of claim 1, wherein the catalyst further comprises filler.
- [c3] 4. The catalyst of claim 1, wherein the catalyst has pores with diameters of about 100 to about 400 Angstroms after calcination.
- [c4] 5. The catalyst of claim 1, wherein the catalyst has a bi-modal distribution of pores.
- [c5] 6. The catalyst of claim 1, wherein the catalyst is in the form of pellets having a surface area of about 100 square meters per gram to about 300 square meters per gram.
- [c6] 7. The catalyst of claim 1, wherein the uncalcined catalyst is in the form of pellets having a pellet density of about

1.30 to about 2.10 grams per cubic centimeter.

- [c7] 8.The catalyst of claim1 having a surface area to volume ratio of about 1100 to about 3800 m<sup>2</sup>/m<sup>3</sup>.  
9.The catalyst of claim 1, wherein the catalyst has an unpacked bulk density of about 900 to about 1200 kilograms per cubic meter.
- [c8] 10.The catalyst of claim 1, wherein the catalyst is in the form of pellets having a diameter of about 1.0 to about 4.0 millimeters and a height of about 2.0 to about 3.0 millimeters.
- [c9] 11.An alkylation catalyst comprising a metal oxide wherein the catalyst has an aspect ratio of about 0.7 to about 1.0.
- [c10] 12.The catalyst of claim 11, wherein the metal oxide comprises magnesium oxide, iron oxide or a combination of the foregoing.
- [c11] 13.The catalyst of claim 11, wherein the catalyst further comprises a filler.
- [c12] 14.The catalyst of claim 11, wherein the catalyst has pores with diameters of about 100 to about 400 Angstroms after calcinations.
- [c13] 15.The catalyst of claim 11, wherein the catalyst has a

bimodal distribution of pores.

[c14] 16.The catalyst of claim 11, wherein the catalyst is in the form of pellets having a surface area of about 100 square meters per gram to about 300 square meters per gram.

[c15] 17.The catalyst of claim 11, wherein the catalyst is in the form of pellets having a pellet density of about 1.3 to about 2.10 grams per cubic centimeter.

[c16] 18.The catalyst of claim 11, having a surface area to volume ratio of about 950 to about 4000  $\text{m}^2/\text{m}^3$ .

19.The catalyst of claim 11, wherein the catalyst has an unpacked bulk density of about 900 to about 1200 kilograms per cubic meter.

[c17] 20.The catalyst of claim 11, wherein the catalyst is in the form of pellets having a diameter of about 1.0 to about 4.0 millimeters and a height of about 2.0 to about 3.0 millimeters.

[c18] 21.An alkylation method comprising reacting a hydroxy aromatic compound with an alkyl alcohol in the presence of an alkylation catalyst comprising a metal oxide wherein the alkylation catalyst, has a surface area to volume ratio of about 950 to about 4,000  $\text{m}^2/\text{m}^3$ , an aspect ratio of about 0.7 to about 1.0 or a combination of the

foregoing.

- [c19] 22.The method of claim 21, wherein the reacting takes place at a temperature of at least about 420°C.
- [c20] 23.The method of claim 21, wherein the metal oxide comprises magnesium oxide, iron oxide or a combination of the foregoing.
- [c21] 24.The method of claim 21, wherein the catalyst has pores with diameters of about 100 to about 400 Angstroms after calcination.
- [c22] 25.The method of claim 21, wherein the catalyst has a bimodal distribution of pores.
- [c23] 26.The method of claim 21, having a surface area to volume ratio of about 1100 to about 3800 m<sup>2</sup>/m<sup>3</sup>.
- [c24] 27.The method of claim 21, wherein the catalyst is in the form of pellets having a diameter of about 1.0 to about 4.0 millimeters and a height of about 2.0 to about 3.0 millimeters.
- [c25] 28.The method of claim 21, wherein the catalyst has an aspect ratio of about 0.7 to about 1.0.
- [c26] 29.An alkylation catalyst comprising a metal oxide wherein the catalyst is in the form of pellets having a di-

ameter of about 1.0 to about 4.0 millimeters and a height of about 2.0 to about 3.0 millimeters.

- [c27] 30.The catalyst of claim 29, wherein the metal oxide comprises magnesium oxide, iron oxide or a combination of the foregoing.
- [c28] 31.The catalyst of claim 29, wherein the catalyst further comprises filler.
- [c29] 32.The catalyst of claim 29, wherein the catalyst has pores with diameters of about 100 to about 400 Angstroms after calcination.
- [c30] 33.The catalyst of claim 29, wherein the catalyst has a bimodal distribution of pores.
- [c31] 34.The catalyst of claim 29, wherein the catalyst has an unpacked bulk density of about 900 to about 1200 kilograms per cubic meter.